Evaluation of factors associated with retained surgical sponges in veterinary patients: a survey of veterinary practitioners

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Evaluation of factors associated with retained surgical sponges in veterinary patients. A survey of veterinary practitioners

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Conflict of interest

None of the authors of this article has a financial or personal relationship with other people or organization that could influence or bias the content of this paper.

Structured Summary

Objectives: To evaluate factors that could be associated with retained surgical sponges in veterinary patients.

Methods: A survey was distributed to 322 veterinarians attending a national veterinary conference. The survey included questions about the types of surgeries performed, staff involved, scheduling, surgical sponges used, methods to track surgical sponges and details of clinical cases of retained surgical sponges seen.

Results: The response rate was 19.9% (64 of 322). Lack of designated scheduled time for surgeries was reported by 29.7% of respondents and was variable for 31.3%. More than half of respondents (65.6%) had 2 people involved per surgery. The majority of respondents sterilised their own surgical sponges (90.6%) and used non-radiopaque surgical sponges (56.3%). Sponge count was not performed by 26.6% of respondents and was occasionally done by 20.3%. Sponge count was reported as not recorded by 70.3% of respondents. The majority (65.6%) did not use or have a surgical checklist. Lack of awareness of gossypibomas was reported by 10.9% of respondents. A case of retained surgical sponge had been seen by 26.6% of respondents. Of the 17 cases reported, 14 were small animals. The abdomen was the most common anatomical location for retained surgical sponges and followed elective neutering.

Discussion: Despite the low response rate, our results suggest that methods of surveillance need improvement to reduce the incidence of retained surgical sponges. Lack of specifically scheduled time for surgery, few theatre staff and lack of sponge counting and documentation may have contributed to the 17 retained surgical sponge cases reported.

Keywords: Gossypiboma, small animal surgery, surgical sponges, checklist

Introduction:

Surgical sponges (SS) are commonly used in surgery for haemostasis, general wound management, to facilitate tissue dissection, and to protect and retract organs (Zeltzman *et al.* 2011).

The retention of foreign bodies (sponges, needles and instruments) in a patient after surgery is a medical error that may result in adverse consequences for the patient and personnel involved (Hariharan *et al.* 2013). Retained surgical sponges (RSS) are the most common retained surgical item (RSI) (Gibbs *et al.* 2007, Manzella *et al*. 2009), representing 50% to 69% of RSI (Gawande *et al.* 2003, Lincourt *et al.* 2007, Manzella *et al.* 2009), leading to gossypiboma (Miller *et al,* 2006).

The reported frequency of gossypiboma in humans appears to be low; however, the true incidence is unknown and may be under-reported for medico-legal reasons (Biswas *et al.* 2012, Gümüs *et al.* 2012) or due to long asymptomatic postoperative periods (Bakan *et al.* 2015, Kaiser *et al.* 1996, Kobayashi *et al.* 2014, Suwatanapongched *et al.* 2005). The incidence of gossypiboma in veterinary surgical patients is unknown.

Several risk factors have been identified in humans for RSS including emergency operations, unplanned changes in the surgical procedure and high body mass index (Gawande *et al.* 2003, Lata *et al.* 2011). Other risk factors identified include poor communication in the surgical team, long operations, unstable patient condition, intraoperative blood loss >500 mL, multiple operations performed by the same surgical team, inadequate number of staff members and inexperienced staff (Gibbs *et al.* 2007, Lata *et al.* 2011, Lincourt *et al.* 2007, Moffatt-Bruce *et al.* 2014). Lack of sponge count and incorrect sponge count has been reported as a significant risk factor in some of these studies (Gibbs *et al.* 2007, Lauwers *et al.* 2000, Moffatt- Bruce *et al.* 2014, Stawicki *et al.* 2014), with the majority of RSI caused by team or system error

rather than isolated human error (Stawicki *et al.* 2014). Risk factors for RSS in veterinary patients have not been established.

The objective of our study was to evaluate factors that could contribute to RSS in veterinary patients and identify possible risk factors for RSS.

Materials and Methods:

A survey (Appendix 1) in hard copy was distributed to veterinarians attending a national veterinary conference hosted by the authors' institution. Conference stream moderators invited participants to confidentially complete and return the survey on the day of the conference. Students and staff members from the hosting institution who attended or participated in the conference, were excluded from the study. Incomplete surveys, defined as those where all questions were not answered, were excluded from further analysis. Colour-coding of the survey and response to the first survey question allowed categorisation of respondents into first opinion small animal practitioners, mixed practitioners (small animal and large animal), large animal practitioners (equine and farm animal), private referral practitioners and university teaching hospitals veterinarians. The subsequent questions were grouped into 4 categories: 1) surgery related questions, including information about caseload, scheduling for surgical procedures and staff involved; 2) type of SS used and number included in the surgical pack; 3) methods of surveillance to track SS, including who performed the sponge count, when it was performed and whether or not a method of recording sponge count existed via checklist or similar document and 4) questions related to RSS and gossypiboma including awareness and recognition of this postsurgical complication and description of clinical cases comprising signalment, surgical procedure where the SS was retained, time from initial surgery to diagnosis and consequences for the patient and personnel involved.

Statistical analysis

Descriptive statistics were calculated using a spreadsheet program (Excel, Microsoft Office 2010, Redmond, Washington) with results expressed as proportions and percentages. The answers for each question were analysed as percentage of the total number of respondents and as percentage of each category of respondent. For questions with more than one answer allowed, the percentage was calculated considering the multiple answers as an additional category.

Results:

All results are displayed in Tables 1, 2, and 3. Three hundred and twenty two practitioners were invited to participate. The response rate was 19.9% (64 of 322). Fifteen of 322 surveys (4.7%) were incomplete and excluded from analysis.

Demographics:

Of the 64 surveys included, 45.3% (29 of 64) were from first opinion small animal practices, 40.6% (26 of 64) from mixed practices, 7.8% (5 of 64) from large animal practices, 4.7% (3 of 64) from private equine referral practices and only 1 from a university teaching hospital.

Surgery related questions:

Survey question 3 related to scheduling of surgery and allowed the respondent to tick more than one category. A consistently defined, protected and dedicated time period for elective surgeries was not incorporated into the routine working day for 61% of respondents (39 of 64), with operations performed between non-surgical procedures in 29.7% (19 of 64) or at variable times depending on other duties carried out at the practice in 31.3% (20 of 64). These were termed 'non-scheduled' surgeries. Of the 39 respondents with non-scheduled time for surgery, 16 were mixed practices and 4 large animal practices, representing 51.3% of the non-scheduled time for surgery. Nine of 64 (14.1%) performed surgeries after non-surgical procedures, 12.5% (8 of 64) had a designated person for surgeries and 9.4% (6 of 64) a designated day. Two respondents ticked the category 'others'. One performed surgeries after non-surgical procedures but had a designated person for this, and the other performed surgeries during the non-opening hours of the practice. Non-surgical procedures did not interfere with scheduling of surgery in all private referral hospitals and the university teaching hospital.

The majority of respondents (52 of 64, 81.2%) had 2 staff members per operation (a veterinary surgeon and an anaesthetist/nurse), although for 15.6% (10 of 64), the second staff member also acted as a surgical assistant for emergencies and complicated cases. Six of 64 respondents (9.4%) consistently had 3 staff members per operation, with 6.3% (4 of 64) having a primary surgeon, an assistant and an anaesthetist, and 3.1% (2 of 64) having an operating room (OR) technician or nurse instead of an assistant surgeon. Four respondents had 4 staff members per operation (primary surgeon, assistant, anaesthetist and OR technician or nurse), while the university teaching hospital involved more than 4 staff members per operation, including surgery students. One large animal practice performed surgeries with the owner of the patient helping during the procedure.

Surgical sponges (SS):

The most common types of SS used were 4x4 non-radiopaque sponges (46.9%, 30 of 64). The use of 10x10 non-radiopaque SS was reported by 9.4% of respondents (6 of 64), while 29.7% (19 of 64) used both types of non-radiopaque SS. The use of SS with radiopaque markers was only reported by 9.4% of respondents (6 of 64), with 1 respondent using 4x4 radiopaque SS and 10x10 non-radiopaque SS, and the other 5 using radiopaque SS of both sizes. Three respondents who ticked the category ‘others’ (2 small animal, 1 large animal) reported using surgical towels or facecloths rather than SS. Due to the nature of data collection, further details regarding the types of swabs used (woven vs. non- woven) were not obtained.

Methods of surveillance for RSS:

Surgical sponges were not counted by 26.6% of respondents (17 of 64), while 20.3% (13 of 64) counted SS occasionally. Three of 64 (4.7%) counted sponges only at the beginning while 29.7% (19 of 64) counted SS at the beginning and at the end of surgery. Eight of 64 (12.5%) counted SS at the beginning, during and at the end of surgery, while 6.3% (4 of 64) ticked the category ‘other’, counting only at the end of surgery (1 of 4) or not using SS in favour of other system (e.g. towels, facecloths).

The sponge count was done by one person in 53.1% (34 of 64), with 25% (16 of 64) done by the primary surgeon and 28.1% (18 of 64) by the person responsible for packing the surgical items. Sponge counts were done by 2 people in 34.4% (22 of 64): the primary surgeon and another staff member in the OR in 18.8% of cases (12 of 64); and the person responsible for packing the surgical items before surgery and the primary surgeon in 15.6% (10 of 64). Sponge count was done by 4 individuals (primary surgeon, assistant, OR staff and responsible of packing the instruments) in the university teaching hospital. Seven of 64 respondents (10.9%) ticked the category 'other' and specified not using SS (3 of 7), or not counting SS (4 of 7).

The majority of respondents (70.3%, 45 of 64) reported not recording sponge count, while 6.3% (4 of 64) reported rarely recording sponge count and 9.4% (6 of 64) reported occasionally recording sponge count. Only 9.4% of respondents (6 of 64) recorded sponge count using a checklist or similar document. The 3 respondents who selected the category 'other' were those who reported not using SS.

Only 23.4% (15 of 64) had a checklist and used it, while 10.9% (7 of 64) had a checklist but it was not routinely used. Forty two of 64 respondents (65.6%) did not have a checklist, with 10.9% (7 of 64) planning to have and use one in the future. Two of the 42 who reported not using a checklist were unaware of the use of checklists in veterinary surgery, as recorded in the comments for this question.

RSS cases:

Seven of 64 respondents (10.9%) were unaware of gossypiboma as a complication of surgery while 89.1% (57 of 64) were aware of this complication. Seventeen of 64 (26.6%) reported direct or indirect involvement in a RSS case, providing clinical details of the case. The career stage of respondents involved in RSS cases was not recorded, making estimates of incidence in the 254 surveyed population impossible.

Seventeen cases of RSS were described, 3 in large animals (2 horses and 1 donkey) and 14 in small animals (13 dogs and 1 cat). Further case details are provided in Table 4. The 3 large animal cases required revision surgery but had good clinical outcomes. However, all 3 cases ended with client complaints and one case ended with the primary surgeon facing legal action taken against him.

One of 14 small animal RSS cases was reported in a referral institution, with the RSS diagnosed due to the presence of radiopaque marker in the SS during postoperative radiographs obtained immediately after thoracic wall tumour resection. The reason for immediate postoperative radiographs was not reported. Thirteen of 14 small animal cases were reported by general practitioners (12 small animal practices, 1 mixed practice). In the small animal cases reported, the RSS was found in the abdomen in 92.9% (13 of 14). Nine of 14 small animal RSS cases (64.3%) occurred following ovariohysterectomy, 8 during an elective procedure and 1 during surgery for pyometra. Two RSS cases occurred following abdominal cryptorchidectomy, 1 RSS following inguinal herniorrhaphy and another following abdominal surgery with no details of the type of procedure performed. The outcome for the 14 small animal cases was good in 78.6% (11 of 14), although one case required 7 days of intensive care hospitalisation prior to discharge, requiring an enterectomy with end to end anastomosis due to development of intestinal adhesions and subsequent malabsorption syndrome. Two of 14 small animal cases (14.3%) died, 1 during revision surgery and 1 within 48 hours of revision surgery. One patient was euthanised during revision surgery due to septic peritonitis. Nine of the small animal cases ended with client complaints with two veterinarians facing litigation. In another small animal case, the veterinary practice covered the financial cost of revision surgery.

Of the 17 RSS cases reported, the surgical procedure was non-scheduled in 70.6% (12 of 17), had low number of staff per surgery (2 persons) in 88.2% (15 of 17) and had non-radiopaque SS used in 88.2% (15 of 17). Sponge count was not performed in 52.9% of cases (9 of 17). In 47.1% (8 of 17), sponge count was done by a single person (7 of 8) either at the beginning (3 of 8) or at the

end of surgery (4 of 8). In the remaining RSS case (1 of 8), sponge count was performed by two people but it was not recorded.

Sponge count was not recorded in 82.4% of RSS cases (14 of 17). In 3 of the 14 cases where sponge count was reported as not performed, the respondents reported having a checklist. In 4 cases reported, sponge count was reported to have been recorded. Of these 4 cases, non-radiopaque SS was reported in 2 cases and low number of staff in all 4 cases.

Discussion:

Based on the results of our survey and the 17 RSS cases described, we propose absence of a defined and scheduled time for surgery, low number of staff involved in the surgical procedure and particularly inadequate methods of surveillance as potential risk factors for RSS in veterinary patients.

Multitasking, time pressure, increased workload and competing tasks pose important threats to patient safety in the operating room, contributing to higher incidences of RSS (Christian *et al.* 2006; Steelman *et al.* 2011). Non-scheduled time for surgery was identified in more than half of the RSS cases described in our study. Although the majority of cases underwent elective surgical procedures, we speculate that time pressure to finish surgery if other non-surgical procedures need to be performed, interruptions during surgery by other staff members or other type of disturbance may have contributed to human error leading to inadequate sponge count and subsequent sponge retention. The potential for RSS may be increased when these circumstances occur in conjunction with unexpected events during surgery, such as intraoperative complications or equipment failure.

Low number of staff (2 persons) involved in surgery was found in 15 of 17 (88.2%) RSS cases and reported by 21 of 26 (80.8%) small animal general practitioners and 19 of 26 (73.1%) mixed animal general practitioners responding to the survey, reflecting the realities of general practice. In these cases, only a primary surgeon and a technician or nurse were present in the operating room. Although general veterinary practice and human hospital practice are not comparable, the experiences in risk reduction in human hospitals may be applicable to veterinary practice. The presence of a surgical assistant in human surgery has been postulated to decrease the incidence of RSI and RSS (Stawicki *et al.* 2014), not only to reduce time for sponge count but also to facilitate verification of counting protocols, particularly in cases where sponge count is incorrect. However, the realities of manpower in general veterinary practice limit options for the numbers of staff involved in surgery.

Basic methods to reduce the risk of RSS include regular surveillance of the surgical field to identify missing sponges, a defined specific number of sponges in the surgical pack and counting SS before and after the procedure (Zeltzman *et al.* 2011). Counting SS before and after the procedure is the most widely used method for screening RSI in humans (Goldberg *et al.* 2012). Despite the simplicity of counting, adequate sponge counting is not commonly performed in veterinary surgery (Zeltzman *et al.* 2011), as we report in our results, with the majority of respondents admitting to not counting SS, doing so occasionally, or counting SS only at the beginning or at the end of surgery. Sponge count is heavily dependent on human performance and subject to error (Gibbs *et al.* 1996). Incorrect sponge count may occur due to fatigue, incorrect package count, unusually haemorrhagic procedures, lack of SS count or declination of repeat SS count in cases with an unsatisfactory initial count (Kaiser *et al.* 1996). It is reasonable to conclude that lack of sponge count or verification of correct sponge count, as observed in our results, can increase the risk of RSS in surgical patients, particularly in emergency situations or when unexpected events occur. Although sponge counting practices do not completely eliminate the risk for RSS (Gawande *et al.* 2003, Kaiser *et al.* 1996), it still represents a simple and inexpensive method to decrease the incidence of RSS in human and veterinary patients.

Surgical sponges can easily be camouflaged in surrounding tissue when soaked with blood, making identification through visual inspection difficult (Zeltzman *et al.* 2011). There are two types of SS depending on the materials their fibres are made of (Zeltzman *et al.* 2011). Non-woven surgical sponges are made of synthetic fibres that provide slightly higher absorption capacity and less lint compared to woven surgical sponges, which are made of cotton (Zeltzman *et al.* 2011). Non-woven SS are also softer and more expensive than woven SS. Our survey was not designed to evaluate which type of SS were used. However, considering the different characteristics of these two types, SS with less absorptive capacity may get lost more easily when soaked with blood. Softer non-woven SS may be more difficult to find by palpation when they are lost in the surgical field.

One of the diagnostic imaging modalities used in suspected RSS cases is plain radiography, which can help identify RSS (Cima *et al.* 2008). Few respondents in our study used SS with a radiopaque marker, likely due to increased cost of radiopaque sponges. In cases where non-radiopaque SS are used, diagnosis of RSS using plain radiographs and even combining them with other diagnostic imaging tests, such as ultrasonography, is challenging (Choi *et al.* 1988). Despite a reported 10% false negative result when plain radiography is used to identify SS (Cima *et al.* 2008), the presence of a radiopaque marker in the SS may facilitate the radiographic identification of the missing SS, as described in the case of the thoracic wall tumour resection. The majority of respondents who were involved in a RSS case reported using non-radiopaque SS. It is unknown if non-radiopaque SS were used during the procedures where the RSS occurred, but if they were, plain radiography would be less likely to identify the missing SS.

Human error in the complex environment of the operating room is inevitable. Surgical safety checklists improve reliability of surgical procedures and help to standardise human patient care (Anwer *et al.* 2016). Implementation of checklists has been associated with reduced mortality rates and complications in human and veterinary surgical patients (Haynes *et al.* 2009, Bergström *et al.* 2016). Recording sponge count could help not only to defend an individual or institution in cases of RSI but also facilitate standardisation and implementation of protocols in the operating room, particularly when there are counting discrepancies (Goldberg *et al.* 2012). Recording of sponge counts was not performed by the majority of respondents in our study, including those with surgical checklists. Performing and recording sponge counts could have helped to reduce the number of RSS cases reported in our study and protect staff involved in litigation.

Abdominal gossypibomas represent 47 to 74% of human RSS cases (Gawande *et al.* 2003, Hariharan *et al.* 2013, Kaiser *et al.* 1996, Lincourt *et al.* 2007, Stawicki *et al.* 2014). The abdomen is the most common location for a sponge to be retained, likely because of the depth of the surgical site and the torturous

nature of the intestines, mesentery and omentum (Zeltzman *et al.* 2011). However, it may also reflect the frequency of abdominal surgery in human patients compared to other cavities or surgical approaches (Zeltzman *et al.* 2011). The majority of RSS cases identified in small animals in our study were found in the abdomen, similar to previous reports in veterinary patients (Day *et al.* 2012, Forster *et al.* 2011, Haddad *et al.* 2010, Krimer *et al.* 2010, Merlo *et al.* 2000, Putwain *et al.* 2009). Ovariohysterectomy was the most common abdominal procedure leading to RSS in our study, similar to previous reports (Forster *et al.* 2011, Merlo *et al.* 2000). This likely reflects the frequency of performing ovariohysterectomy in small animal patients, but may also occur secondary to a complication of the procedure itself, such as intraoperative haemorrhage from an ovarian pedicle.

In our study, 3 large animal cases of RSS were reported, 2 in horses and 1 in a donkey. To our knowledge, this postsurgical complication has not been previously reported in large animals. In large animals, large body cavities and body weight may make detection of RSS more challenging.

Twelve of the 17 RSS cases reported ended with client complaints. In fact, three veterinarians faced legal actions against them. This highlights the importance of RSS in veterinary patients, as described in humans, not only leading to medical complications for the patient, but also having a significant economic impact.

One limitation of our study is the low response rate. Response rates can be affected by the survey topic and the sensitive nature of the topic (Cunningham *et al.* 2015). We observed a higher response rate for small animal practitioners compared to large animal practitioners. Lack of reported large animal cases in the veterinary literature and lack of awareness of this postsurgical complication in large animal patients could have contributed to the low response rate for this group. Although we might have improved the response rate using a different survey design or method of distribution, the information collected in our study provides a reasonable indication of the standards followed by the respondents

and demonstrates the occurrence of this surgical complication in veterinary patients.

Another limitation of our study is potential duplication of results. The surveys were completed by attendees to a national conference, some of whom could have worked in the same institution at the time of answering the questions, providing duplicate information about the standards followed at the practice. However, details provided for the 17 RSS cases suggested no duplication of cases. We lack details of the time period over which these cases were seen, making inference of incidence of this complication impossible in our study population.

A third limitation is directly related to the information provided about the RSS cases. Based on the details obtained with the survey and considering its confidentiality, it is unknown if the cases were detected in the practice where the respondents worked at the time of filling the survey or if the respondents were involved in the case when working in a different place. A retrospective study, analysing all the conditions that cause the RSS to occur would have been required to evaluate the factors leading to this postsurgical complication.

Based on the results of our study, the incidence of RSS in veterinary patients seems to be low, as reported in previous studies (Forster *et al.* 2011). However, our survey was not designed to evaluate over what period the cases were observed or the career length of respondents. Veterinary surgeons with less experience may not have been exposed to RSS cases while more experienced clinicians may have been exposed to more clinical cases during their career. Calculation of odds ratio to identify risk factors was not possible in our study. A multi-institutional study including a larger number of cases is warranted to compare results and determine risk factors for RSS in veterinary patients.

Absence of a protected and dedicated time for surgery, reduced number of staff per surgery and inadequate methods of surveillance may be risk factors for

RSS in veterinary patients and could have contributed to the 17 cases reported in this study. Abdominal surgery and particularly ovariohysterectomy may be surgical procedures of increased risk for RSS and consequently gossypiboma in small animals. Education of the surgical team, standardisation of protocols, development of local counting protocols, adherence to counting protocols before skin incision and at the completion of surgery and recording of sponge count are recommended methods of surveillance to reduce the incidence of this postsurgical complication. We believe sponge counts should be standard surgical practice in every surgical procedure in veterinary patients.

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Figure 1: Chronic fistula in the gluteal region caused by a retained surgical sponge in an adult Labrador 6 months after femoral head and neck ostectomy. Courtesy of Laura Cuddy

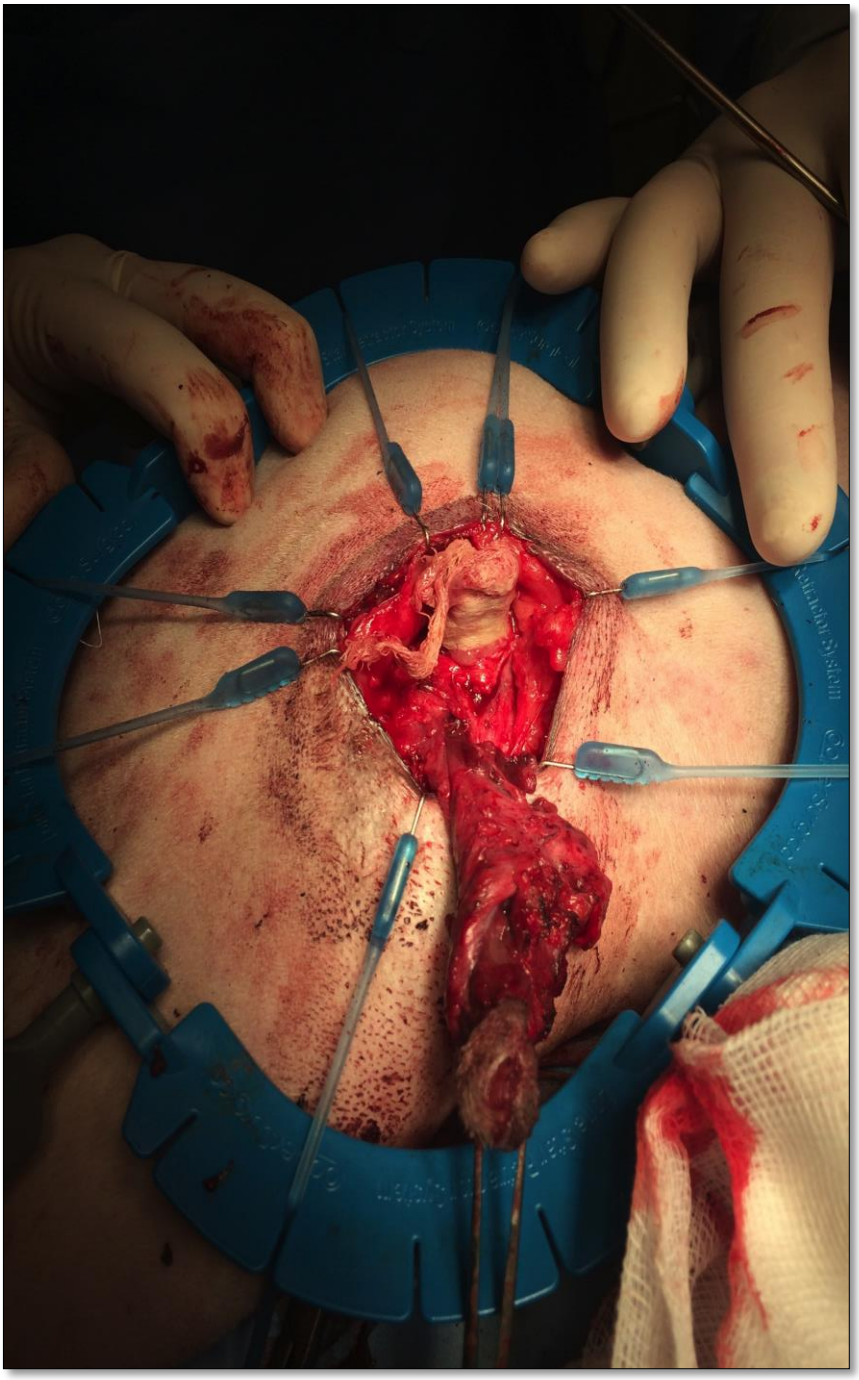

Table 1. Survey results for surgery-related questions expressed as percent *(number)* responses.

Group 1	**General Practices**			**Referral Practices**		**Total**
Type of surgery	*Small Animals (n=29)*	*Mixed Practices (n=26)*	*Large Animals (n=5)*	*Private Referrals (n=3)*	*Universities (n=1)*	***(n=64)***
Abdominal	10.3 *(n=3)*	23.1 *(n=6)*	20 *(n=1)*			**15.6** *(n=10)*
Soft tissue (ST), abdominal included	24.1 *(n=7)*	15.4 *(n=4)*	20 *(n=1)*			**18.8** *(n=12)*
Thoracic (T)						
Orthopaedics (O)						
Emergencies (E)	3.4 *(n=1)*	3.8 *(n=1)*				**3.1** *(n=2)*
Others (e.g. minimally invasive)						
ST + T + E	6.9 *(n=2)*	19.2 *(n=5)*	20 *(n=1)*		100 *(n=1)*	**14.1** *(n=9)*
ST + O	13.8 *(n=4)*	19.2 *(n=5)*		33.3 *(n=1)*		**15.6** *(n=10)*
ST + O + E	17.2 *(n=5)*	7.7 *(n=2)*	20 *(n=1)*			**12.5** *(n=8)*
ST + T + O	6.9 *(n=2)*			33.3 *(n=1)*		**4.7** *(n=3)*
ST + T + O + E	17.2 *(n=5)*	11.5 *(n=3)*	20 *(n=1)*	33.3 *(n=1)*		**15.6** *(n=10)*
Scheduling of surgery						
Between other procedures	31 *(n=9)*	34.6 *(n=9)*	20 *(n=1)*			**29.7** *(n=19)*
After other procedures	20.7 *(n=6)*	7.7 *(n=2)*		33.3 *(n=1)*		**14.1** *(n=9)*

Designated person	6.9 *(n=2)*	15.4 *(n=4)*	20 *(n=1)*		100 *(n=1)*	**12.5** *(n=8)*
Designated day	6.9 *(n=2)*	15.4 *(n=4)*				**9.4** *(n=6)*
Variable	34.5 *(n=10)*	26.9 *(n=7)*	60 *(n=3)*			**31.3** *(n=20)*
Others				66.7 *(n=2)*		**3.1** *(n=2)*
Staff involved in surgery						
Surgeon (S) + Anaesthetist (ANA)	72.4 *(n=21)*	73.1 *(n=19)*	40 *(n=2)*			**65.6** *(n=42)*
S + ANA. Assistant for emergencies	20.7 *(n=6)*	15.4 *(n=4)*				**15.6** *(n=10)*
S + ANA + Assistant		3.8 *(n=1)*	20 *(n=1)*	66.7 *(n=2)*		**6.3** *(n=4)*
S + ANA + OR* staff	3.4 *(n=1)*		20 *(n=1)*			**3.1** *(n=2)*
S + ANA + Assistant + OR staff	3.4 *(n=1)*	3.8 *(n=1)*	20 *(n=1)*	33.3 *(n=1)*		**6.3** *(n=4)*
Others (e.g. vet students)		3.8 *(n=1)*			100 *(n=1)*	**3.1** *(n=2)*

*OR = Operating room

Table 2. Survey results for questions related to type of surgical sponges used, expressed as percent (number) responses.

	General Practices			Referral Practices		
Who prepares the surgical packages	***Small Animals (n=29)***	***Mixed Practices (n=26)***	***Large Animals (n=5)***	***Private Referrals (n=3)***	***Universities (n=1)***	**Total *(n=64)***
Surgeon	10.3 *(n=3)*	11.5 *(n=3)*	40 *(n=2)*			**12.5** *(n=8)*
Nurses	58.6 *(n=17)*	34.6 *(n=9)*	60 *(n=3)*			**45.3** *(n=29)*
Designated person	17.2 *(n=5)*	53.8 *(n=14)*		100 *(n=3)*	100 *(n=1)*	**35.9** *(n=23)*
All staff	13.8 *(n=4)*					**6.3** *(n=4)*
Others						
Type of SS† used						
Non- radiopaque 4x4	31 *(n=9)*	73.1 *(n=19)*	40 *(n=2)*			**46.9** *(n=30)*
Non- radiopaque 10x10	6.9 *(n=2)*	15.4 *(n=4)*				**9.4** *(n=4)*
Non- radiopaque both sizes	44.8 *(n=13)*	11.5 *(n=3)*		100 *(n=3)*		**29.7** *(n=19)*
Radiopaque 4x4; non- radiopaque 10x10	3.4 *(n=1)*					**1.6** *(n=1)*
Radiopaque both sizes	6.9 *(n=2)*		40 *(n=2)*		100 *(n=1)*	**7.8** *(n=5)*
Others (e.g. towels, facecloths)	6.9 *(n=2)*		20 *(n=1)*			**4.7** *(n=3)*
Sterilization of SS†						

Yes	93.1 *(n=27)*	92.3 *(n=24)*	60 *(n=3)*	100 *(n=3)*	100 *(n=1)*	**90.6** *(n=58)*
No. Buy them sterile		7.7 *(n=2)*	20 *(n=1)*			**4.7** *(n=3)*
Others (e.g. not used)	6.9 *(n=2)*		20 *(n=1)*			**4.7** *(n=3)*
Number of SS† per pack						
Specific number	93.1 *(n=27)*	84.6 *(n=22)*	40 *(n=2)*	33.3 *(n=1)*	100 *(n=1)*	**82.8** *(n=53)*
No	3.4 *(n=1)*	15.4 *(n=4)*	40 *(n=2)*	66.7 *(n=2)*		**14.1** *(n=9)*
Others (e.g. not used)	3.4 *(n=1)*		20 *(n=1)*			**3.1** *(n=2)*
Fixed number of SS† per pack	89.7 *(n=26)*	84.6 *(n=22)*	40 *(n=2)*	33.3 *(n=1)*	100 *(n=1)*	**81.3** *(n=52)*
Variable number of SS† per pack	3.4 *(n=1)*	7.7 *(n=2)*		66.7 *(n=2)*		**7.8** *(n=5)*
Unknown number	6.9 *(n=2)*	7.7 *(n=2)*	60 *(n=3)*			**10.9** *(n=7)*

†SS = Surgical sponges

Table 3. Survey results for questions related to methods of surveillance to track surgical sponges, expressed as percent *(number)* responses

Group 3	**General Practices**			**Referral Practices**		**Total** ***(n=64)***
Time for sponge count	***Small Animals (n=29)***	***Mixed Practices (n=26)***	***Large Animals (n=5)***	***Private Referrals (n=3)***	***Universities (n=1)***	
Beginning of surgery	3.4 *(n=1)*	7.7 *(n=2)*				**4.7** *(n=3)*
Beginning and end of surgery	44.8 *(n=13)*	15.4 *(n=4)*		66.7 *(n=2)*		**29.7** *(n=19)*
Beginning, during and end of surgery	10.3 *(n=3)*	15.4 *(n=4)*			100 *(n=1)*	**12.5** *(n=8)*
Occasional count. Sometimes forget	24.1 *(n=7)*	19.2 *(n=5)*		33.3 *(n=1)*		**20.3** *(n=13)*
Not performed	17.2 *(n=5)*	30.8 *(n=8)*	80 *(n=4)*			**26.6** *(n=17)*
Others		11.5 *(n=3)*	20 *(n=1)*			**6.3** *(n=4)*
Who performs sponge count						
Primary surgeon	37.9 *(n=11)*	7.7 *(n=2)*	60 *(n=3)*			**25** *(n=16)*
Responsible of sterilising SI¶	20.7 *(n=6)*	46.2 *(n=12)*				**28.1** *(n=18)*
Primary surgeon + responsible of sterilising SI¶	17.2 *(n=5)*	19.2 *(n=5)*				**15.6** *(n=10)*
Primary surgeon + OR staff	17.2 *(n=5)*	15.4 *(n=4)*		100 *(n=3)*		**18.8** *(n=12)*
4 persons					100 *(n=1)*	**1.6** *(n=1)*
Others (e.g. do not count)	6.9	11.5	40			**10.9** *(n=7)*

	(n=2)	*(n=3)*	*(n=2)*			
Record of sponge count						
No	62.1 *(n=18)*	76.9 *(n=20)*	80 *(n=4)*	100 *(n=3)*		**70.3** *(n=45)*
Rarely	6.9 *(n=2)*	7.7 *(n=2)*				**6.3** *(n=4)*
Occasionally	13.8 *(n=4)*	7.7 *(n=2)*				**9.4** *(n=6)*
Yes (checklist or similar)	10.3 *(n=3)*	7.7 *(n=2)*			100 *(n=1)*	**9.4**
Others	6.9 *(n=2)*		20 *(n=1)*			**4.7** *(n=3)*
Checklist						
Yes. In use	27.6 *(n=8)*	15.4 *(n=4)*	20 *(n=1)*	33.3 *(n=1)*	100 *(n=1)*	**23.4** *(n=15)*
Yes but not used	13.8 *(n=4)*	11.5 *(n=3)*				**10.9** *(n=7)*
No. Plan to use	10.3 *(n=3)*	15.4 *(n=4)*				**10.9** *(n=7)*
No	48.3 *(n=14)*	57.7 *(n=15)*	80 *(n=4)*	66.7 *(n=2)*		**54.7** *(n=35)*
Others						

¶SI = Surgical instruments

Table 4: Summary of retained surgical sponge cases reported.

Specie	Breed	Location RSS	Surgical procedure leading to RSS	Time from initial surgery to diagnosis	Treatment	Patient outcome	Consequences
Large animals							
Equine	Irish Sport Horse	Orbit	Enucleation	12 months	Revision surgery	Good	Client complaint
Equine	Thoroughbred	Oral mucosa	Mandibular tumour	6 months	Revision surgery	Good	Client complaint. Litigation
Donkey	Irish Donkey	Scrotum	Orchidectomy	2 days	Revision surgery	Good	Client complaint
Small Animals							
Canine	Cocker Spaniel	Thoracic wall	Thoracic wall tumour	Immediately post- op	Revision surgery	Good	Increased anaesthetic time
Feline	Domestic Shorthaired	Abdomen	Elective OVH‡	Unknown	Revision surgery	Good	Client complaint
Canine	Cavalier King Charles	Abdomen	Unknown	1 day	Revision surgery	Good	Client complaint
Canine	Yorkshire terrier	Pelvic inlet	Elective OVH‡	3 months	Revision surgery	Good	Veterinarian covered cost
Canine	Terrier	Abdomen	Elective OVH‡	1 month	Revision surgery	Euthanasia for septic peritonitis	Client complaint. Litigation
Canine	Cocker Spaniel	Abdomen	Elective OVH‡	12 months	Revision surgery	Good	Client complaint
Canine	Greyhound	Abdomen	Cryptorchidectomy	2 days	Revision surgery	Death during	Client complaint

						revision surgery	
Canine	Cross breed	Abdomen	Elective OVH‡	Unknown	Revision surgery	Good	Client complaint
Canine	Golden retriever	Abdomen	Elective OVH‡	2 years	Revision surgery	Death during post-op hospitalization	Client complaint. Litigation
Canine	Cross breed	Abdomen	Elective OVH‡	2 weeks	Revision surgery	Good	Increased cost
Canine	Cavalier King Charles	Abdomen	Cryptorchidectomy	10 days	Revision surgery	Malabsorption syndrome	7 days ICU care. Increased cost
Canine	Terrier	Abdomen	Inguinal herniorrhaphy	Unknown	Revision surgery	Good	Unknown
Canine	Cross breed	Abdomen	Elective OVH‡	4 days	Revision surgery	Good	Client complaint
Canine	Boxer	Abdomen	OVH‡ for pyometra	12 months	Revision surgery	Good	Client complaint

‡OVH = Ovariohysterectomy

Appendix 1

Evaluation of the risk factors for retained surgical sponges in veterinary practices

Introduction

This survey has been designed to identify risk factors of retained surgical swabs in veterinary practice. It is part of a resident research project. The aim of the study is to compare results to those previously described in human medicine and establish surveillance methods to decrease the incidence of this surgical complication in veterinary patients.

Please fill the survey honestly and accurately. Your answer will be treated with maximum confidentiality and anonymity. This survey will take approximately 7 minutes to complete. Thank you for participating in this study.

Instructions

This survey has been designed with a colour code, depending on the nature of your veterinary practice/ business (blue for small animals; red colour large animals). If you are working in a mixed practice (e.g. 50% small animals; 50% large animals), please fill the appropriate box in question 1. All the questions are multiple-choice questions. At the end of each question, there is a blank field to make comments or reflect a different answer in case you have not chosen any of the others.

Please leave the survey in the cardboard box placed outside of the room before the end of the session.

Thank you again for your participation.

Evaluation of the risk factors for retained surgical sponges in veterinary practices

1. Define your place of work

   ☐ Small Animal General Practice
   ☐ Large Animal General Practice (Equine, Bovine, both)
   ☐ Mixed Small Animal and Large Animal Practice
   ☐ Private Referral Veterinary Hospital (Small Animals, Large Animals)
   ☐ University Teaching Veterinary Hospital
   ☐ Other (Please specify)

   _____

   _____

2. Please describe the type of surgical procedures routinely performed at your place of work. (Tick the relevant box/ boxes)

   ☐ Elective abdominal surgery (e.g. neutering, exploratory laparotomies)
   ☐ Elective soft tissue surgeries (surgical management of wounds, oncologic procedures, surgery of the respiratory tract, abdominal surgery)
   ☐ Orthopaedic surgery (cruciate ligament repair, fractures, arthroscopy)
   ☐ Thoracic surgery (including minimally invasive techniques)
   ☐ Emergency surgical procedures (e.g..haemoabdomen, colic surgery)
   ☐ Other (e.g. No surgeries are performed) (Please specify)

   _____

   _____

3. If you are performing surgical procedures at your place of work, when are they performed? (Tick more than one box if needed)

   ☐ In between other non-surgical procedures (e.g. consultations)
   ☐ After other non-surgical procedures (e.g. afternoon when consults are completed, end of the day)
   ☐ There is a designated person to perform surgical procedures. Non-surgical procedures do not interfere with the surgery schedule
   ☐ There is a designated day to perform surgical procedures. Non-surgical procedures do not interfere with the surgery schedule
   ☐ Variable, depending on how the day goes
   ☐ Other (Please specify)

   _____

   _____

4. How many staff members are involved on each surgical procedure?

- ☐ A veterinary surgeon and an anaesthetist/ nurse per case
- ☐ A veterinary surgeon, an anaesthetist/ nurse and a surgical assistant (e.g. resident, intern, student)
- ☐ A veterinary surgeon and an anaesthetist/ nurse per case. For difficult cases or emergencies, a surgical assistant is available if needed.
- ☐ A veterinary surgeon, an anaesthetist/ nurse and other operating personnel/ technician (e.g. theatre nurse)
- ☐ A veterinary surgeon, an anaesthetist/ nurse, a surgical assistant and other operating personnel/ technician
- ☐ Other (Please specify)

_____
_____

5. Who normally prepares and packages the surgical instruments/ items at your place of work?

- ☐ The same individual who performs the surgical procedure
- ☐ Any member of the nursing staff
- ☐ A designated person (nurse, technician, others)
- ☐ All staff perform these duties
- ☐ Other (Please specify)

_____
_____

6. What type of surgical sponges/ swabs do you use at your place of work?

- ☐ Small, 4x4 inch, non-radiopaque surgical swabs
- ☐ Large, 10x10 inch, non-radiopaque laparotomy swabs
- ☐ Small 4x4 inch and large 10x10 inch non-radiopaque laparotomy swabs
- ☐ Radiopaque small 4x4 inch surgical sponges. Non-radiopaque 10x10 inch large laparotomy sponges
- ☐ Radiopaque small 4x4 inch and large 10x10 inch laparotomy sponges
- ☐ Other (Please specify)

_____
_____

7. Do you sterilize and pack your surgical sponges?

   ☐ Yes
   ☐ No. I buy them sterile and they are not opened until use
   ☐ Other (Please specify)

   _____
   _____

8. If your surgical packs contain surgical sponges, are there a specific number of sponges in each pack?

   ☐ Yes
   ☐ No.
   ☐ Other (Please specify)

   _____
   _____

- If so, how many sponges are included? (Please specify number)_____

9. When do you count your surgical sponges? (Tick the relevant box/ boxes)

   ☐ At the beginning of the surgical procedure, before starting the surgery
   ☐ At the beginning of the surgery and at the end, before closure
   ☐ At the beginning of the surgery, during the surgical procedure and at the end before closure
   ☐ I occasionally count surgical sponges. Sometimes I forget to do it
   ☐ I do not tend to count surgical sponges.
   ☐ Other (Please specify)

   _____
   _____

10. Who performs the swab count?

- ☐ Only the primary surgeon
- ☐ The person responsible for packing and sterilising the instruments before surgery
- ☐ The person responsible for packing and sterilising the instruments before surgery and the primary surgeon
- ☐ The primary surgeon and someone else to double-check at time of swab counting (anaesthetist, surgical assistant, theatre nurse).
- ☐ 4 persons: the person responsible for packing the instruments, the primary surgeon, the surgical assistant and someone else at time of sponge counting to double check
- ☐ Other (Please specify)

_____

_____

11. Have you or your work colleagues ever seen or being involved in a case of a retained surgical sponge following a surgical procedure?

- ☐ No. I was not aware of this complication
- ☐ No, but I was aware of this complication
- ☐ Yes. I have seen or been involved in cases of retained surgical sponges
- ☐ Others (Please specify)

_____

_____

- If a retained surgical swab has been identified, please provide the following details if known:

  Species of animal_____

  Breed_____

  Body weight_____

  Location of retained surgical swab (RSS)_____

  Surgical procedure where RSS left in situ_____

  Time from initial surgery when RSS was left to diagnosis_____

Outcome_____

12. Do you keep record of your sponge count?

- ☐ No
- ☐ Rarely
- ☐ Occasionally
- ☐ Yes. Sponge count is recorded in a checklist or similar medical document (e.g. anaesthetic sheet, surgical report)
- ☐ Others (Please specify)

_____

_____

13. Are you using checklists at your place of work?

- ☐ Yes. We have a checklist. It is used routinely in surgical procedures
- ☐ Yes. We have a checklist. Unfortunately it is not routinely used
- ☐ No, but we are planning to design one and we are hoping to start using it shortly
- ☐ No.
- ☐ Other (Please specify)

_____

_____

UCD School of Veterinary Medicine wants to thank you again for taking the survey.

Please make some comments on this page if you desire

Send Form